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Environmental and Security Upgrades to Preserve Library Collections

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Overview:
The Rhode Island Historical Society (RIHS) project "Environmental and Security Upgrades to Preserve Library Collections" installed a modern, efficient environmental and humidity control (HVAC) system to protect the archival, image-related, and printed collections stored and used for public research in the RIHS's Library building in Providence as well as an addressable fire alarm system, emergency lighting, exit signs, and a new fire escape, to better protect collections and users. New windows were installed to replace 30-year-old windows with compromised seals and cracked panes of glass, increasing energy efficiency and improving the appearance of the Library façade. The new HVAC equipment, windows, and fire detection systems better protect the Library's collections, comprised of over 600,000 items or groups, which constitute the most important extant collections of historical Rhode Island materials.

Project Activities:

Original Work Plan

During the project period 7/1/2012 to 6/30/2013, the work plan called for work to begin with building repairs and ordering of HVAC equipment while RIHS staff members moved the film collection. Leveling pads would be poured, and the old boiler isolated while least-accessed book stacks were wrapped. The Library would close while geothermal wells were drilled; trenching and grouting of the wells would be completed, and, while the Library remained closed to the public, Library staff would complete interior preparations. Pipe and pumps would be installed, old air handling units removed, and new ones installed. New ductwork would be installed, pump connected, and wireless sensors and controls installed while Library staff monitored the work and moved and protected collections. By 6/30/2013, the punchlist was to have been completed and the system put into full service.

Changes to Project Plans

The project initially called for a geothermal HVAC system, but on the advice of engineers, the RIHS opted for a highly efficient conventional system still driven by humidity rather than temperature controls.

The project was delayed when anticipated funding did not come through. This extended the project to June 30, 2015; the project was fully funded in late November 2013.

A leak in the existing HVAC system caused a flood on December 17, 2013; restoration work proceeded in conjunction with the bid process for the RIHS Library Renovations. Renovation work began immediately after restoration work was complete.

Project Begins

Starting in July 2012, architect Cornelis J. DeBoer and engineer Jason Sousa of Creative Environment completed initial interior investigations of the RIHS Library, and consulted with engineers specializing in geothermal installations. Several meetings were held at the RIHS Library so that engineers and consultants could examine and explore current conditions and

understand project constraints including the need for careful coordination between the RIHS Staff and contractors.

Emergency Boiler Replacement

On September 5, 2012, the RIHS Library boiler, a 5-section cast iron Weil-MacLean unit installed in October 2006, failed due to cracks in the front and back sections of the boiler. The boiler provided heat to the entire building, both public and storage spaces. The RIHS solicited proposals with the assistance of Creative Environment, and settled on a solution proposed by Phalanx Engineering, Inc. using two Buderus high-efficiency boilers to provide redundancy and to run the boilers in a lead-lag sequence. Work began on October 9 with demolition of the old boiler and removal of piping, heat exchanger, a defunct pump, and the boiler pad. By October 22, installation was complete, and heat was provided to the upper, storage floors by means of the forced-air ducts used by the air conditioning system.

Switch from Geothermal to High-Efficiency Conventional System

The RIHS Board Facilities Committee met on October 31, 2012; Cornelis DeBoer of Haynes DeBoer, Jason Sousa of Creative Environment and Mike Zimmerman, a specialist in geothermal projects with Allied Engineering joined the meeting to report on their findings. Mr. Zimmerman advised the committee that in his opinion, the Society lacked adequate land around the Library building to accommodate a closed-loop geothermal project: while the yard is large enough for 8 wells, the cooling tonnage needed to condition the building would require 12 closed-looped wells. The alternative of using standing column wells is not recommended due to the unpredictable nature of water production in wells, and the geological conditions of the ledge under the East Side of Providence. The Facilities Committee voted to have architect and engineer move ahead with a conventional system to replace the aging (now 42-years-old) HVAC system at the RIHS Library.

Funding Setback

On Thursday, November 15, 2012, the Society was notified that it would not receive anticipated funding from a local private foundation. Although new estimates based on updated drawings were expected in January, this funding setback delayed the project by a full year.

Haynes + DeBoer Associated and Creative Environment Corporation engineers provided the complete drawings for architectural and engineering work to the RIHS on February 15, 2013. These drawings called for a conventional but high-efficiency HVAC system designed to favor humidity controls over temperature controls for maintaining an optimal environment for the RIHS Library collections, including new zones and additional ductwork for the Fourth Floor, as well as the upgrades to the utilities in the basement and the fire safety system, and window replacement.

In all, Phase II interior and exterior construction work and architectural fees were estimated to cost between $925,505 and $1,026,141. The RIHS submitted a new proposal to the Champlin Foundations for $209,000 to fund the window replacement portion of the project, and the Board of Trustees of the RIHS approved the use of up to $150,000 in Reserve Funds generated by the sale of deaccessioned collections for construction costs associated with the

HVAC project. Both the American Association for State and Local History and the American Alliance for Museums were consulted, and both organizations felt that the use of these funds for HVAC upgrades was appropriate use of funds for "direct care of collections."

Extensions Requested and Received

The Society applied for extensions from the IMLS and the NEH, and received approval to extend the project to June 30, 2015. The revised work plan called for completion and issuance of bid packages in December 2013 and the receipt of bids in January 2014. On November 21, 2013, the RIHS received notification that the Champlin Foundations awarded the Society $209,397 to fund the window replacement portion of the project. As soon as this news was received, staff alerted Haynes + DeBoer Architects to the need to update bid packages and prepare them for release. Final drawings were sent to the Rhode Island Historic Preservation and Heritage Commission (RIHPHC) for the Section 106 review requested by the NEH; that review is underway and RIHPHC confirmed receipt of the drawings on November 22, 2013.

Water Leak and Emergency Response

On December 17, 2013, a drain in the humidifier units attached to the old air handling unit on the 3rd floor overflowed, sending water through floor vents to the second and first floors, including the public Reading Room. Collections damage was minimal thanks to the rapid response of the Collections Staff, but the Reading Room required restoration, including remediation of vinyl asbestos floor tile discovered under the 24-year-old carpet.

In making plans to continue cataloging and reference work during construction, RIHS Collections staff members worked with the Rhode Island Collection Librarian at Providence Public Library (PPL) to provide space for RIHS patrons to access collections using inter-library loan services, and to also host research appointments for RIHS Librarians to work with researchers engaged in long-term projects; this arrangement was particularly helpful during the emergency-response restoration work and planned renovations, allowing patron access despite the Library remaining closed to the public for a year.

Receipt of Bids and Awarding of Contract

The revised work plan called for the completion and issuance of bid packages in December, and the receipt of bids in January 2014. The bid package was issued on February 5, 2014, and bids were due back to the architect's office on February 28, 2014. All bidders general and sub- contractors attended a pre-bid meeting on Wednesday, February 19, 2014; 22 representatives attended. The low bid was submitted by E. W. Burman, Inc. for $786,200. A contract was signed with E. W. Burman on March 24, 2014.

Section 106 Review Completed

On March 21, a letter dated March 3, 2014 was received from the Rhode Island Historic Preservation and Heritage Commission (RIHPHC) stating the opinion that the project will have "no adverse effect on historical resources provided that the windows on the building façade (west

elevation) have clear glass, rather than spandrel and translucent glass as proposed." The RIHS requested written confirmation of changes to project specifications, which were subsequently sent to both the RIHPHC and the NEH. On April 8, a Public Notice about the RIHS Library Renovations was posted on the RIHS website as part of the requirements for the NEH Section 106 review. No public comments were received during the period for public comment, which closed on May 8, 2014. On June 12, 2014, the Rhode Island Historic Preservation and Heritage Commission completed its final review of the RIHS Library Renovations and issued a letter stating that the project would have no adverse affect on historical resources. This completed the NEH Section 106 review allowing the project to proceed.

Variances Granted

On June 17, 2014, the architect, Cornelis J. De Boer and RIHS Director of Collections Kirsten Hammerstrom attended a hearing of the State of Rhode Island Rehabilitation Code Board. The Rehabilitation Code Board reviewed the RIHS Renovation plans and the request for variances related to the width of the second floor emergency exit door, the width and rise of the fire escape stairs, and the rating of the steel window on the first floor behind the fire escape stairs. The City of Providence Building Inspector had reviewed and approved the plans but recommended further review by the Rehabilitation Code Board. After discussion and re-reading of the Rehabilitation Code, the variances were granted.

Written notice of the decision of the State of Rhode Island Rehabilitation Code Board to grant variances for the RIHS Library Renovation Plan was received on July 21, 2014; Haynes DeBoer Associates, as the applicant on behalf of the Rhode Island Historical Society, received the written decision and provided a copy to the RIHS for the project record on July 29, 2014.

Building Permit Issued: Work Begins

On June 26, 2014, a building permit was officially granted and work began onsite on July 14, 2014.

Electrical Work

Electrical work began on July 14, 2014, when new electrical service was brought into the building a new electrical panel installed on the building exterior, as well as an emergency generator connection. Inside the building, electricians installed new addressable smoke and heat detectors and fire alarm pull stations on all four floors and in the basement; new emergency backup lights and illuminated exit signs were installed, along with strobe-horn annunciators, throughout the Reading Room and all staff areas in the upper floors., trenching from a new electrical service pole to the RIHS Library to allow for underground service. Protector wire was installed in the attic space above the Library's closed stacks, bringing the building into compliance with current fire codes; to meet current code, protector wire was also installed in the space between the drop ceiling and second floor in the Library's lobby and Reading Room. A new Fire Alarm Control Panel (FACP) and master box connecting the Library's fire alarm system directly to the Providence Fire Department were also installed, and the City of Providence Communications Department installed a new cable for the connection on September

25, 2014. This addressable system will allow the fire department to respond more accurately and efficiently to a fire alarm within the building.

New Air Handling Units, Condensers, and Duct Work

Mechanical contractor Phalanx Engineering reviewed plans and worked with RIHS to begin with the removal of the first floor air handling unit, humidifier, and ductwork as well as the condensing unit serving the first floor HVAC zone. A microclimate was built around the microfilm storage cabinets in the Reading Room, and dehumidifiers ran to modulate any humidity increases during the week of the HVAC switchover for that zone. By July 22, the switchover was complete and the new air handling unit running for the first floor zones.

On October 6, the third-floor AHU was installed using a reach forklift to slide the unit through the open window frame on the north façade of the building. The unit was designed and selected with lift installation in mind, though sized to provide air circulation and humidity control for three zones of collections storage.

At the same time, ductwork installation and piping was underway on the fourth floor, creating a new zone and bringing much-needed humidity and temperature control to the previously un-controlled 4th floor. On the first floor, a new condensate drain line was installed, upgrading the size of the drain pipe and re-pitching the run of the pipe to ensure constant flow. A domestic water line supplying water to the third floor humidifiers was found unsecured; the mechanical contractors re-hung and supported the line to bring it into compliance with current code.

By the end of October, all HVAC equipment had been installed; control and sensor devices were installed and wired in November. Controls programming began in mid-November, with adjustments made as the system ran in and spaces were occupied. Balancing also took place in mid-November, and adjustments were made to the AHU output on the first floor, which was at 130% of required cubic feet per minute. After system balancing, the first floor was noticeably quieter. On December 12, the controls were turned over to RIHS staff who were trained in monitoring and adjusting the system; it is programmed to send automatic alerts and text messages to the Director of Collections and Buildings and Grounds Supervisor when the indoor temperature is below 60 degrees, the humidity above 65%, or in case the system loses power.

Work Completed, Reading Room Reopens

With installation of windows and systems complete in the first week of November, RIHS staff members unwrapped the Reading Room stacks, and cleaned the room from top to bottom, a week-long process for five staff members. All surfaces and books were wiped and vacuumed to remove grit and fine dust. The same process continued in the stacks, as staff members cleaned open aisles in preparation for moving materials relocated for window installation.

The Reading Room re-opened with limited service to researchers on December 4, 2015; partial hours continued until full services were restored Wednesday, January 14, 2015. During December and the first weeks of January, staff members not assisting the public continued to clean and restore the closed stacks.

On January 5, 2015, a dark, opaque window film was applied to the interior of the new windows. The baked-on frit applied to the window glass before glazing did not match the color specified by the architect and based on samples supplied by the window manufacturer. To solve

this problem, an interior film was agreed upon, and applied at the window manufacturer's expense. The general contractor's staff oversaw the application and worked with RIHS Library staff to coordinate installation and protection of the collections.

Throughout the late winter, small punch list items were corrected, including boiler flue gasket replacements, the plugging of holes where piping from the old system was removed, and the stabilization of the basement handrail.

Manuals and as-built drawings were delivered by the contractor on December 30, 2014. In early April, a final review will take place with RIHS Staff and Haynes De Boer Associated in verify completion of all contractual requirements, and the final requisition from E. W. Burman will be paid.

Accomplishments:

With new windows and new HVAC system installed, the Library climate is both more stable and better controlled than in previous decades. The new system responds to external environmental changes more rapidly than the old system, which had an average three-day lag; RIHS staff members worked closely with Phalanx Engineering to adjust controls as needed to best respond to climate changes. Preservation of materials is enhanced, while staff and patrons alike are more comfortable working in both the Reading Room and the closed stacks.

The greatest delay was caused by the lack of expected funding. When the anticipated Champlin Foundations grant was not received in November 2012, the project was set back by a full year. The news that the RIHS had not received the grant was unexpected, as Foundation representatives met with both RIHS Executive Director Morgan Grefe and Director of Collections Kirsten Hammerstrom to discuss the Society's preservation and renovation needs.

In response, Dr. Grefe conferred with both the American Alliance of Museums (AAM) (RIHS's accrediting body) and the American Association for State and Local History (AASLH) on the appropriateness of using Reserve Funds generated by the sale of deaccessioned collections for construction costs associated with the HVAC project. Both the AAM and the AASLH agreed that HVAC upgrades to improve storage conditions and enhance long-term preservation were direct care of collections, and thus appropriate. Despite this allocation by the RIHS Board of Trustees, and despite careful value engineering of project costs, project funding remained short.

When the last piece of funding was received in November 2013, the RIHS moved as rapidly as possible to send drawings out to bid. The bid process was delayed slightly by staff changes at Creative Environment, as the original project engineer, Jason Sousa, died; the electrical engineer left the firm, and was replaced; each staff change meant that new engineers had to gain familiarity with the project design, the RIHS site and staff, and the constraints of working in a historic building holding historic collections.

A more significant delay came in the installation of the new windows. While not funded by the IMLS, the installation of HVAC equipment was dependent on the removal of the existing windows, which could not take place until the new windows were delivered. Although window delivery had been promised by August 24, and complete installation promised by September 25, Diamond Window encountered weeks of delays trying to locate sheet glass large enough for the windows after their initial glass supplier failed to honor their contract. Equally problematic was the fact that Diamond Window delayed telling the general contractor, E. W. Burman, about the problems procuring glass, until mid-August.

Window installation began September 22, three days before installation was to be complete. One new first-floor window was installed, and the four smaller front windows delivered that day; installation averaged two windows per day, starting with the first floor north and south façade windows and the west façade windows. The upper storey windows spanning all three upper levels of the building were not delivered until October, and installation was not complete until the week of October 21.

Ultimately, compared to the revised workplan, which called for the reopening of the Library in March 2015, the project was not delayed, since full services were restored in mid-January 2015. One of the key lessons of the project is central to all construction projects: expect delays.

Another central lesson is "begin as you mean to go on." From previous construction projects, Director of Collections Kirsten Hammerstrom learned the value of extensive and detailed communication with all project team members, and the importance of clearly outlining on-site behavior expectations to the Site Supervisor and all foremen at the beginning of the project; these rules were outlined in the pre-bid meeting and walk through to ensure that all contractors and sub-contractors understood the importance of the RIHS Collections, and the need to follow all rules concerning materials delivery and storage, no-flame construction methods, and integrated pest management procedures—or, as the workmen put it, the "no coffee cups inside" rule.

Compromises were reached, and break rooms established for workmen and staff to keep food and beverages removed from collections areas. RIHS staff members and contractors met weekly to discuss progress and policies, and informally as needed to address small problems as they arose. Communicating extensively and respectfully made for a far smoother project, and was essential to success, as workmen and RIHS staff shared closed quarters, given that both teams were sharing workspace.

The Library Reading Room became a construction staging area and meeting space.

Exterior work included new electrical panels and an emergency generator hookup.

The new condensing unit for the first floor zones was installed first.

On the third floor, the old air handling unit was disassembled for removable and replacement; pieces were removed through the window opening.

The new air handling unit was delivered through the same window opening.

The new air handling unit was in place and ready to be connected to existing and new ductwork.

First floor window installation began in late September.

Continuation of the Project:

RIHS staff members and Phalanx Engineering continue to monitor the Library's environment, as the system nears its one-year anniversary. With a year's worth of data, it will be possible to compare the system performance to previous years, with efficiency measured in kilowatt and natural gas usage. RIHS staff can then begin to analyze the difference between temperature-driven and humidity driven HVAC systems over time.

Long Term Impact:

The RIHS held its annual meeting in the newly-renovated Library on November 12, 2014, inviting members to see the newly-finished Library before it re-opened. Throughout the winter, a series of tours gave RIHS members, supporters, and local museum and library directors a behind-the-scenes look at the new equipment and controls, renovated and improved basement and utilities, and the work done to move, protect, and return collections to shelving moved or wrapped during construction.

The RIHS's standing as a community leader in preservation and collections management has been significantly enhanced by the attention to renovations and environmental systems at the RIHS Library. The aesthetic improvement of the replacement windows, which more closely resemble the windows installed in the 1920s, when the building was the Tockwotten branch of the Providence Public Library, has solidified the Society's position as a leader in historic preservation and thoughtful attention to historic properties.

As local library partners like the Providence Public Library undertake renovation projects, their special collections staff members have contacted RIHS Staff members for advice on protecting and managing collections during renovation projects, recognizing the successful management and completion of this major renovation project.